CLAIMS

1. A method of establishing a connection in a network, the method comprising the step of:

configuring, in a node of the network, a first mapping for use in forwarding data frames, the first mapping being from a combination of:

a first network address uniquely identifying, within an addressing scheme of the network, a first node of the network, and

a first identifier,

the first mapping being to a selected output port of the node,

the configuring thereby establishing at least part of a first connection for forwarding data frames, the connection being through the node,

the first identifier being a qualifier of the first network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the first node.

2. A method according to claim 1, wherein the first network address is a destination address.

3. A method according to claim 1, wherein the first network address is a source address.

4. A method according to claim 1, comprising the further step of:

configuring, in the node, a second mapping for use in forwarding data frames, the second mapping being from a combination of:

a second network address uniquely identifying, within an addressing scheme of the network, a second node of the network and

a second identifier,

the second mapping being to a selected output port of the node, the configuring thereby establishing at least part of a second connection through the node,

the selected output ports of the node being respectively different for the first and second mappings, thereby enabling, at the node, differential forwarding of data frames associated with the first and second connections.

5. A method according to claim 4, wherein the first and second addresses are the same and the first and second identifiers are different.

6. A method according to claim 5, wherein the first and second network addresses are a destination address.

7. A method according to claim 5, wherein the first and second network addresses are a source address.

8. A method according to claim 4, wherein the first and second addresses are different and the first and second identifiers are the same.

9. A method according to claim 8, wherein the first and second network addresses are destination addresses.

10. A method according to claim 8, wherein the first and second network addresses are source addresses.

11. A method according to claim 4, wherein a data frame is associated with either the first or second connection in dependence on a combination of an address and identifier of the data frame.

12. A method according to claim 1, wherein the network is an Ethernet network and the one or more nodes are Ethernet switches.

13. A method according to claim 12, wherein the identifier is a VLAN tag or part thereof.

14. A method according to claim 12, wherein the identifier is an IEEE 802.1Q field or part thereof.

15. A method according to claim 12, wherein the identifier is an MPLS label or part thereof.

16. A method according to claim 12, wherein the identifier is a DiffServ codepoint (DSCP) or part thereof.

17. A method according to claim 12, wherein the identifier is an IPv6 flow identifier or part thereof.

18. A method according to claim 12, wherein the data frames are MAC frames transported over MAC frames.

19. A method according to claim 12, wherein the data frames are Pseudo-Wire frames transported over MAC frames.

20. A method according to claim 1, wherein the network is an IP network and the one or more nodes are IP routers.

21. A method according to claim 20, wherein the identifier is an MPLS label or part thereof.

22. A method according to claim 20, wherein the identifier is a DiffServ codepoint (DSCP) or part thereof.

23. A method according to claim 20, wherein the identifier is an IPv6 flow identifier or part thereof.

24. A method according to claim 1, wherein the configuring is performed by a control or management plane of the network.

25. A method according to claim 24, wherein the control or management plane of the network is centralised.

26. A method according to claim 24, wherein the control or management plane of the network is distributed.

27. A method according to claim 24, wherein the control plane is ASON/ASTN.

28. A method according to claim 1, wherein the network is at least partially meshed.

29. A method according to claim 1, comprising the further step of:

performing admission control in the network to enable the first connection to have a determined level of QoS.

30. A method according to claim 29, wherein the admission control is performed in a control or management plane of the network.

31. A method according to claim 29, wherein the admission control is performed in a data plane of the network.

32. A method according to claim 29, wherein the admission control is policed to the determined QoS level in a data plane of the network.

33. A method according to claim 29, wherein the admission control is performed in one or more nodes of the network.

34. A method according to claim 1, comprising the further step of:

monitoring status of the first connection by transmitting data frames over the first connection.

35. A method according to claim 34, wherein the data frames transmitted over the first connection are test data frames.

36. A method according to claim 35, wherein the test data frames are received and filtered from other data frames at an end point of the first connection.

37. A method according to claim 1, comprising the further step of:

monitoring status of the first connection by transmitting test data frames over a one or more links between nodes of the network, at least one of said links being transited by the first connection.

38. A method according to claim 37, wherein the transmitting is also used to monitor status of connections other than the first connection.

39. A method according to claim 1, comprising the further step of:

providing protection for at least part of the first connection by establishing a protection connection at least partially separately routed from the first connection.

40. A method according to claim 39, wherein the protection connection is at least partly established by configuring, in a node of the network, a third mapping for use in forwarding data frames, the third mapping being from a combination of:

a third network address uniquely identifying, within an addressing scheme of the network, a third node of the network, and

a third identifier,

the third mapping being to a selected output port of the node.

the third identifier being a qualifier of the third network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the third node.

41. A method according to claim 40, wherein the first and third network addresses are the same and the first and third identifiers are different.

42. A method according to claim 40, wherein the first and third network addresses are different and the first and third identifiers are the same.

43. A method according to claim 40, wherein the first and third network addresses are the same, the first and third identifiers are the same, and wherein the selected output ports of the node are respectively different for the first and third mappings.

44. A method according to claim 41, comprising the further step of:

performing a protection switch in respect of data frames transmitted over the first connection by changing an identifier of data frames to be transmitted from the first identifier to the third identifier.

45. A method according to claim 42, comprising the further step of:

performing a protection switch in respect of data frames transmitted over the first connection by changing a network address of data frames to be transmitted from the first network address to the third network address.

46. A method according to claim 43, comprising the further step of:

performing a protection switch by removing the first mapping.

47. A method according to claim 40, comprising the further step of:

performing buffering of data frames at one or more nodes of the network at which the first connection and the protection connection converge, thereby to avoid out-of-order delivery of data frames.

48. A method according to claim 12, wherein broadcast on unknown destination address functionality is disabled on Ethernet switches of the network.

49. A method according to claim 12, wherein broadcast on unknown destination address functionality is rate limited on Ethernet switches of the network.

50. A method of forwarding customer data frames across a carrier network, the method comprising the steps of:

establishing a first connection in the carrier network according to the method of claim 1;

receiving data frames from a customer;

associating the customer with the first connection;

forwarding the data frames over the first connection;

receiving the data frames over the first connection; and

associating the data frames received over the first connection with the customer.

51. A method according to claim 50, wherein the data frames are received from the customer through a customer attachment interface, the customer attachment interface having a service instance identifier,

wherein the step of associating the customer with the first connection comprises associating the service instance identifier with the first connection, and

wherein the step of associating the data frames received over the first connection with the customer comprises associating the data frames received over the first connection with the customer attachment interface on the basis of the service instance identifier.

52. A method of forwarding customer data frames across a carrier network, the method comprising the steps of:

establishing a first connection in the carrier network according to the method of claim 1;

receiving data frames from a customer through a customer attachment interface of a network node; mapping the customer attachment interface to a service instance identifier;

associating the service instance identifier with the first connection;

encapsulating the customer data frames to further include the service instance identifier and the first network address and first identifier associated with the first connection;

forwarding the data frames over the first connection;

receiving the data frames over the first connection;

de-encapsulating the customer data frames;

associating the data frames received over the first connection with a customer on the basis of the service instance identifier; and

delivering the data frames over the customer attachment interface associated with the service instance identifier.

53. A method of forwarding customer data frames across a carrier network, the method comprising the steps of:

establishing a first connection in the carrier network according to the method of claim 1;

receiving data frames from a first customer through a customer attachment interface of a network node;

mapping the customer attachment interface to a first service instance identifier;

associating the first service instance identifier with the first connection;

receiving data frames from a second customer having a second service instance identifier;

associating the second service instance identifier with the first connection;

encapsulating the data frames from the first and second customers to further include the first and second service instance identifiers and the first network address and first identifier associated with the first connection;

forwarding the data frames over the first connection;

receiving the data frames over the first connection;

de-encapsulating the data frames;

associating the data frames received over the first connection with one of the first and the second customers on the basis of the service instance identifier; and

delivering the data frames over the customer attachment interface associated with the service instance identifier.

54. A method of forwarding customer data frames across a carrier network, the method comprising the steps of:

establishing a plurality of duplex connections, to, from, or through a first node in the carrier network according to the method of claim 1,

receiving customer data frames at the first node, the data frames having been received over one of the plurality of connections, the data frames having a customer source address;

in response, learning a mapping between the customer source address and the one connection;

receiving customer data frames at the first node, the data frames having a customer destination address equal to the customer source address; and

on the basis of the mapping, forwarding the received customer data frames, from the first node over the one connection.

55. A method of providing a VPLS by establishing a mesh of connections in a carrier network according to the method of claim 1, the mesh being between two or more nodes of the network each offering customer attachment interfaces for Ethernet services, the nodes offering conventional Ethernet functionality for customer data frames received and transmitted on the customer attachment interfaces, whilst such customer data frames are transmitted across the carrier network using one of the mesh of connections according to a mapping defined by the learned association between customer MAC address and a connection to the customer attachment interface through which that customer MAC address can be reached.

56. A method of providing a VPLS by establishing a plurality of connections in a carrier network according to the method of claim 1, the connections being between each of two or more spoke nodes of the network offering customer attachment interfaces for Ethernet services and one or more hub nodes, said hub node or nodes also each being connected to one or more conventional Ethernet switches, whereby all received customer data frames are sent to a hub node using one of the connections, thence to the attached conventional Ethernet switch which learns an association between customer MAC address and a connection to the customer attachment interface through which that customer MAC address can be reached.

57. A method of forwarding data frames across a carrier network, the method comprising the steps of:

establishing a first connection in the carrier network according to the method of claim 1, wherein at least part of the first identifier designates one of a plurality of forwarding classes;

forwarding data frames having the first identifier across the first connection according to the one forwarding class.

58. A method according to claim 57, comprising the further step of:

mapping a customer designated forwarding class to the at least part of the first identifier.

59. A method according to claim 57, comprising the further step of:

mapping data frames of a first customer to a first forwarding class; and

mapping data frames of a second customer to a second forwarding class.

60. A method according to claim 1, wherein the selected output port designates a forwarding class.

61. A method of operating a mixed mode network, the method comprising the steps of:

reserving a first plurality of identifier values for use in a first forwarding mode of the network, the first plurality of identifier values being for use in establishing connections in the network according to the method of claim 1;

and reserving a second different plurality of identifier values for use in a second different forwarding mode of the network.

62. A method according to claim 61, wherein the network is an Ethernet network, and the identifiers are VLAN tags.

63. A method according to claim 62, wherein broadcast on unknown destination address functionality is disabled on Ethernet switches of the network in respect of data frames having VLAN tags in the first reserved plurality of identifier values.

64. A method according to claim 62, wherein the second forwarding mode uses auto learning of MAC addresses.

65. A method according to claim 1, comprising the further step of:

forwarding data frames having the first network address and first identifier from at least two different ingress nodes of the network, the data frames being co-routed at one or more nodes of the network.

66. A method according to claim 65, wherein the one or more nodes of the network at which data frames are co-routed is an egress node of the network.

67. A method of multiplexing customer data frames, comprising the steps of:

establishing a first connection in a carrier network according to the method of claim 1, the first connection having a first destination address and a first identifier;

establishing a second connection in the carrier network according to the method of claim 1, the second connection having the first destination address and a second identifier, wherein the first and second connections are co-routed at one or more nodes of the network; and

multiplexing first and second customer data frames by forwarding the first and second customer data frames using the first and second connections respectively.

68. A method of multiplexing customer data frames, comprising the steps of:

establishing a first connection in a carrier network according to the method of claim 1, the first connection having a first destination address and a first identifier;

establishing a second connection in the carrier network according to the method of claim 1, the second connection having a second destination address and the first identifier, wherein the first and second connections are co-routed at one or more nodes of the network; and

multiplexing first and second customer data frames by forwarding the first and second customer data frames using the first and second connections respectively.

69. A method of establishing a connection in a network, the method comprising the step of:

configuring, in a node of the network, a first mapping for use in forwarding data frames, the first mapping being from a combination of:

a first multicast network address uniquely identifying, within an addressing scheme of the network, a group of first nodes of the network, and

a first identifier,

the first mapping being to a plurality of selected output ports of the node,

the configuring thereby establishing at least part of a first connection for forwarding data frames, the connection being through the node,

the first identifier being a qualifier of the first network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the group of first nodes.

70. A connection controller for establishing a connection in a network, the connection controller comprising:

a signal generator arranged in use to generate a first signal for configuring, in a node of the network, a first mapping for use in forwarding data frames, the first mapping being from a combination of:

a first network address uniquely identifying, within an addressing scheme of the network, a first node of the network, and

a first identifier,

the first mapping being to a selected output port of the node,

the configuring thereby establishing at least part of a first connection for forwarding data frames, the connection being through the node,

the first identifier being a qualifier of the first network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the first node.

71. A connection controller according to claim 70, wherein the first network address is a destination address.

72. A connection controller according to claim 70, wherein the first network address is a source address.

73. A connection controller according to claim 70, arranged in use to generate a second signal for configuring, in the node, a second mapping for use in forwarding data frames, the second mapping being from a combination of:

a second network address uniquely identifying, within an addressing scheme of the network, a second node of the network and

a second identifier,

the second mapping being to a selected output port of the node, the configuring thereby establishing at least part of a second connection through the node,

the selected output ports of the node being respectively different for the first and second mappings, thereby enabling, at the node, differential forwarding of data frames associated with the first and second connections.

74. A connection controller according to claim 73, wherein the first and second addresses are the same and the first and second identifiers are different.

75. A connection controller according to claim 74, wherein the first and second network addresses are a destination address.

76. A connection controller according to claim 74, wherein the first and second network addresses are a source address.

77. A connection controller according to claim 73, wherein the first and second addresses are the different and the first and second identifiers are the same.

78. A connection controller according to claim 77, wherein the first and second network addresses are destination addresses.

79. A connection controller according to claim 77, wherein the first and second network addresses are source addresses.

80. A connection controller according to claim 4, wherein a data frame is associated with either the first or second connection in dependence on a combination of an address and identifier of the data frame.

81. A connection controller according to claim 70, wherein the network is an Ethernet network and the one or more nodes are Ethernet switches.

82. A connection controller according to claim 81, wherein the identifier is a VLAN tag or part thereof.

83. A connection controller according to claim 81, wherein the identifier is an IEEE 802.1Q field or part thereof.

84. A connection controller according to claim 81, wherein the identifier is an MPLS label or part thereof.

85. A connection controller according to claim 81, wherein the identifier is a DiffServ codepoint (DSCP) or part thereof.

86. A connection controller according to claim 81, wherein the identifier is an IPv6 flow identifier or part thereof.

87. A connection controller according to claim 81, wherein the data frames are MAC frames transported over MAC frames.

88. A connection controller according to claim 81, wherein the data frames are Psuedo-Wire frames transported over MAC frames.

89. A connection controller according to claim 70, wherein the network is an IP network and the one or more nodes are IP routers.

90. A connection controller according to claim 89, wherein the identifier is an MPLS label or part thereof.

91. A connection controller according to claim 89, wherein the identifier is a DiffServ codepoint (DSCP) or part thereof.

92. A connection controller according to claim 89, wherein the identifier is an IPv6 flow identifier or part thereof.

93. A connection controller according to claim 70, wherein the connection controller forms at least part of a control or management plane of the network.

94. A connection controller according to claim 70, wherein the connection controller is a single node of the network.

95. A connection controller according to claim 70, wherein the connection controller is a distributed set of nodes of the network.

96. A connection controller according to claim 93, wherein the control plane is ASON/ASTN.

97. A connection controller according to claim 70, wherein the network is at least partially meshed.

98. A connection controller according to claim 70, comprising an admission controller arranged in use to perform admission control in the network to enable the first connection to have a determined level of QoS.

99. A connection controller according to claim 70, comprising a connection monitor arranged in use to monitor status of the first connection by transmitting or receiving data frames over the first connection.

100. A connection controller according to claim 99, wherein the data frames transmitted or received over the first connection are test data frames.

101. A connection controller according to claim 99, comprising a filter arranged in use to filter the test data frames from other data frames received.

102. A connection controller according to claim 70, comprising a connection monitor arranged in use to monitor status of the first connection by transmitting or receiving test data frames over a one or more links between nodes of the network, at least one of said links being transited by the first connection.

103. A connection controller according to claim 102, wherein the connection monitor uses the transmitting or receiving to monitor status of connections other than the first connection.

104. A connection controller according to claim 70, arranged in use to establish a protection connection at least partially separately routed from the first connection thereby providing protection for at least part of the first connection.

105. A connection controller according to claim 39, wherein the protection connection is at least partly established by the connection controller configuring, in a node of the network, a third mapping for use in forwarding data frames, the third mapping being from a combination of:

a third network address uniquely identifying, within an addressing scheme of the network, a third node of the network, and

a third identifier,

the third mapping being to a selected output port of the node.

the third identifier being a qualifier of the third network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the third node.

106. A connection controller according to claim 105, wherein the first and third network addresses are the same and the first and third identifiers are different.

107. A connection controller according to claim 105, wherein the first and third network addresses are different and the first and third identifiers are the same.

108. A connection controller according to claim 105, wherein the first and third network addresses are the same, the first and third identifiers are the same, and wherein the selected output ports of the node are respectively different for the first and third mappings.

109. A connection controller according to claim 108, arranged to perform a protection switch by removing the first mapping.

110. A connection controller for establishing a connection in a network, the connection controller comprising:

a signal generator for generating a signal for configuring, in a node of the network, a first mapping for use in forwarding data frames, the first mapping being from a combination of:

a first multicast network address uniquely identifying, within an addressing scheme of the network, a group of first nodes of the network, and

a first identifier,

the first mapping being to a plurality of selected output ports of the node,

the configuring thereby establishing at least part of a first connection for forwarding data frames, the connection being through the node,

the first identifier being a qualifier of the first network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the group of first nodes.

111. A network comprising a node configured with a first mapping for use in forwarding data frames, the first mapping being from a combination of:

a first network address uniquely identifying, within an addressing scheme of the network, a first node of the network, and

a first identifier,

the first mapping being to a selected output port of the node,

the configuring thereby establishing at least part of a first connection for forwarding data frames, the connection being through the node,

the first identifier being a qualifier of the first network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the first node.

112. A network according to claim 111, wherein the first network address is a destination address.

113. A network according to claim 111, wherein the first network address is a source address.

114. A network according to claim 111, wherein the node is configured with a second mapping for use in forwarding data frames, the second mapping being from a combination of:

a second network address uniquely identifying, within an addressing scheme of the network, a second node of the network and

a second identifier,

the second mapping being to a selected output port of the node, the configuring thereby establishing at least part of a second connection through the node,

the selected output ports of the node being respectively different for the first and second mappings, thereby enabling, at the node, differential forwarding of data frames associated with the first and second connections.

115. A network according to claim 114, wherein the first and second addresses are the same and the first and second identifiers are different.

116. A network according to claim 115, wherein the first and second network addresses are a destination address.

117. A network according to claim 115, wherein the first and second network addresses are a source address.

118. A network according to claim 114, wherein the first and second addresses are the different and the first and second identifiers are the same.

119. A network according to claim 118, wherein the first and second network addresses are destination addresses.

120. A network according to claim 118, wherein the first and second network addresses are source addresses.

121. A network according to claim 114, wherein the node associates a data frame with either the first or second connection in dependence on a combination of an address and identifier of the data frame.

122. A network according to claim 111, wherein the network is an Ethernet network and the one or more nodes are Ethernet switches.

123. A network according to claim 122, wherein the identifier is a VLAN tag or part thereof.

124. A network according to claim 122, wherein the identifier is an IEEE 802.1Q field or part thereof.

125. A network according to claim 122, wherein the identifier is an MPLS label or part thereof.

126. A network according to claim 122, wherein the identifier is a DiffServ codepoint (DSCP) or part thereof.

127. A network according to claim 122, wherein the identifier is an IPv6 flow identifier or part thereof.

128. A network according to claim 122, wherein the data frames are MAC frames transported over MAC frames.

129. A network according to claim 122, wherein the data frames are Psuedo-Wire frames transported over MAC frames.

130. A network according to claim 111, wherein the network is an IP network and the one or more nodes are IP routers.

131. A network according to claim 130, wherein the identifier is an MPLS label or part thereof.

132. A network according to claim 130, wherein the identifier is a DiffServ codepoint (DSCP) or part thereof.

133. A network according to claim 130, wherein the identifier is an IPv6 flow identifier or part thereof.

134. A network according to claim 111, comprising a control or management plane arranged to perform the configuring.

135. A network according to claim 134, wherein the control or management plane of the network is centralised.

136. A network according to claim 134, wherein the control or management plane of the network is distributed.

137. A network according to claim 134, wherein the control plane is ASON/ASTN.

138. A network according to claim 111, wherein the network is at least partially meshed.

139. A network according to claim 111, comprising an admission controller arranged in use to perform admission control in the network to enable the first connection to have a determined level of QoS.

140. A network according to claim 139, wherein the admission control is part of a control or management plane of the network.

141. A network according to claim 139, wherein the admission controller is part of the node of the network.

142. A network according to claim 111, comprising a connection monitor arranged in use to monitor status of the first connection by transmitting or receiving data frames over the first connection.

143. A network according to claim 142, wherein the data frames over the first connection are test data frames.

144. A network according to claim 143, wherein the test data frames are received and filtered from other data frames at an end point of the first connection.

145. A network according to claim 111, comprising a connection monitor arranged in use to monitor status of the first connection by transmitting or receiving test data frames over a one or more links between nodes of the network, at least one of said links being transited by the first connection.

146. A network according to claim 145, wherein the transmitting or receiving is also used to monitor status of connections other than the first connection.

147. A network according to claim 111, arranged in use to provide protection for at least part of the first connection by establishing a protection connection at least partially separately routed from the first connection.

148. A network according to claim 147, comprising a node of the network wherein the protection connection is at least partly established by configuring a third mapping for use in forwarding data frames, the third mapping being from a combination of:

a third network address uniquely identifying, within an addressing scheme of the network, a third node of the network, and

a third identifier,

the third mapping being to a selected output port of the node.

the third identifier being a qualifier of the third network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the third node.

149. A network according to claim 148, wherein the first and third network addresses are the same and the first and third identifiers are different.

150. A network according to claim 148, wherein the first and third network addresses are different and the first and third identifiers are the same.

151. A network according to claim 148, wherein the first and third network addresses are the same, the first and third identifiers are the same, and wherein the selected output ports of the node are respectively different for the first and third mappings.

152. A network according to claim 149, wherein a protection switch in respect of data frames transmitted over the first connection is performed by changing an identifier of data frames to be transmitted from the first identifier to the third identifier.

153. A network according to claim 150, wherein a protection switch in respect of data frames transmitted over the first connection is performed by changing a network address of data frames to be transmitted from the first network address to the third network address.

154. A network according to claim 151, wherein a protection switch is performed by removing the first mapping.

155. A network according to claim 148, comprising a data frame buffer at one or more nodes of the network at which the first connection and the protection connection converge, the buffer being for avoiding out-of-order delivery of data frames.

156. A network according to claim 122, wherein broadcast on unknown destination address functionality is disabled on Ethernet switches of the network.

157. A network according to claim 122, wherein broadcast on unknown destination address functionality is rate limited on Ethernet switches of the network.

158. A carrier network for forwarding customer data frames across a carrier network, the carrier network comprising:

a first connection established according to the method of claim 1;

an ingress node arranged in use to receive data frames from a customer having a customer identifier;

a mapper arranged in use to map the first connection to the customer identifier;

an egress node arranged in use to receive data frames forwarded over the first connection; and

an associator arranged in use associate the data frames received over the first connection with the customer on the basis of the mapping.

159. A carrier network for forwarding customer data frames, the carrier network comprising:

plurality of duplex connections, to, from, or through a first node in the carrier network established according to the method of claim 1,

the first node being arranged in use to:

receive customer data frames over one of the plurality of connections, the data frames having a customer source address;

learn a mapping between the customer source address and the one connection in response to receiving the customer data frames; and

forward further received customer data frames having a customer destination address equal to the customer source address over the one connection on the basis of the mapping.

160. A carrier network arranged in use to provide a VPLS and comprising a mesh of connections established according to the method of claim 1, the mesh being between two or more nodes of the network each offering customer attachment interfaces for Ethernet services, the nodes offering conventional Ethernet functionality for customer data frames received and transmitted on the customer attachment interfaces, whilst such customer

data frames are transmitted across the carrier network using one of the mesh of connections according to a mapping defined by the learned association between customer MAC address and a connection to the customer attachment interface through which that customer MAC address can be reached.

161. A carrier network arranged in use to provide a VPLS and comprising a plurality of connections established according to the method of claim 1, the connections being between each of two or more spoke nodes of the network offering customer attachment interfaces for Ethernet services and one or more hub nodes, said hub node or nodes also each being connected to one or more conventional Ethernet switches, whereby all received customer data frames are sent to a hub node using one of the connections, thence to the attached conventional Ethernet switch which learns an association between customer MAC address and a connection to the customer attachment interface through which that customer MAC address can be reached.

162. A carrier network for forwarding data frames, the carrier network comprising:

a first connection established according to the method of claim 1, wherein at least part of the first identifier designates one of a plurality of forwarding classes;

forwarding means arranged in use to forward data frames having the first identifier across the first connection according to the one forwarding class.

163. A carrier network according to claim 162, comprising:

a mapper arranged in use to map a customer designated forwarding class to the at least part of the first identifier.

164. A carrier network according to claim 162, comprising:

a mapper arranged in use to map data frames of a first customer to a first forwarding class and data frames of a second customer to a second forwarding class.

165. A network according to claim 111, wherein the selected output port designates a forwarding class.

166. A mixed mode network comprising:

connections established in the network according to the method of claim 1 using a first plurality of identifier values reserved for use in a first forwarding mode of the network, a second different plurality of identifier values being reserved for use in a second different forwarding mode of the network.

167. A network according to claim 166, wherein the network is an Ethernet network, and the identifiers are VLAN tags.

168. A network according to claim 167, wherein broadcast on unknown destination address functionality is disabled on Ethernet switches of the network in respect of data frames having VLAN tags in the first reserved plurality of identifier values.

169. A network according to claim 166, wherein the second forwarding mode uses auto learning of MAC addresses.

170. A network according to claim 111, comprising:

at least two different ingress nodes of the network from which data frames having the first network address and first identifier are forwarded, the data frames being co-routed at one or more nodes of the network.

171. A network according to claim 170, wherein the one or more nodes of the network at which data frames are co-routed is an egress node of the network.

172. A carrier network for multiplexing customer data frames, the carrier network comprising:

a first connection established according to the method of claim 1, the first connection having a first destination address and a first identifier;

a second connection established according to the method of claim 1, the second connection having the first destination address and a second identifier, wherein the first and second connections are co-routed at one or more nodes of the network; and

wherein first and second customer data frames are multiplexed by forwarding the first and second customer data frames using the first and second connections respectively.

173. A carrier network for multiplexing customer data frames, the carrier network comprising:

a first connection established according to the method of claim 1, the first connection having a first destination address and a first identifier;

a second connection established according to the method of claim 1, the second connection having a second destination address and the first identifier, wherein the first and second connections are co-routed at one or more nodes of the network; and

wherein first and second customer data frames are multiplexed by forwarding the first and second customer data frames using the first and second connections respectively.

174. A network comprising a node configured with a first mapping for use in forwarding data frames, the first mapping being from a combination of:

a first multicast network address uniquely identifying, within an addressing scheme of the network, a group of first nodes of the network, and

a first identifier,

the first mapping being to a plurality of selected output ports of the node,

the configuring thereby establishing at least part of a first connection for forwarding data frames, the connection being through the node,

the first identifier being a qualifier of the first network address, the combination thereby enabling differential forwarding, at the node, of data frames addressed to or from the group of first nodes.

175. A network comprising one or more nodes arranged to perform the method of claim 1.

176. A computer program arranged to perform the method of claim 1.

177. A method of establishing connections in a frame-based network, the method comprising the step of:

configuring, in one or more nodes of the network, first mappings for use in forwarding data frames, the first mappings being from a combination of:

a first destination address corresponding to a first destination node of the network, and

a first identifier,

the first mappings being to a selected output port of, or to respective selected output ports of each of, the one or more nodes, thereby establishing at least part of a first connection through the one or more nodes to the first destination node.

178. A method according to claim 177 comprising the further step of:

configuring, in at least one of the nodes, a second mapping for use in forwarding data frames, the second mapping being from a combination of:

a second destination address corresponding to a second destination node of the network, and

a second identifier,

the second mapping being to a selected output port of the at least one node, thereby establishing at least part of a second connection through the at least one node to the second destination node,

the selected output ports of the at least one node being different for the first and second mappings, thereby enabling, at the at least one node, differential forwarding of data frames associated with the first and second connections.

179. A method according to claim 178, wherein the first and second destination addresses and the first and second destination nodes are the same.

180. A method according to claim 178, wherein the first and second identifiers are the same.

181. A method according to claim 178, wherein the at least one node associates data frames with one of the first and second connections in dependence on a destination address and identifier of the frame.

182. A method according to claim 177, wherein the network is an Ethernet network and the one or more nodes are Ethernet switches.

183. A method according to claim 182, wherein the identifier is a VLAN tag.

184. A method according to claim 177, wherein the configuration is performed by a control plane of the network.

185. A method according to claim 184, wherein the control plane is ASON/ASTN.

186. A method according to claim 177, wherein the network is at least partially meshed.

187. A frame-based communications network comprising one or more nodes arranged to perform the method of claim 177.

188. Software arranged to perform the method of claim 177.

189. A connection controller for establishing connections in a frame-based network, the connection controller comprising:

a signal generator capable of generating a first signal for configuring, in a transport node of the network, a first mapping for use in forwarding data frames, the first mapping being from a combination of:

a first destination address corresponding to a first destination node of the network, and

a first identifier,

the first mapping being to a selected output port of the transport node, the first signal thereby establishing at least part of a first connection through the transport node to the first destination node.

190. A connection controller according to claim 189, wherein the signal generator is capable of generating a second signal for configuring, in the transport node of the network, a second mapping for use in forwarding data frames, the second mapping being from a combination of:

a second destination address corresponding to a second destination node of the network, and

a second identifier,

the second mapping being to a selected output port of the transport node, the second signal thereby establishing at least part of a second connection through the transport node to the second destination node,

the selected output ports of the transport node being different for the first and second mappings, the first and second signals thereby enabling, at the transport node, differential forwarding of data frames associated with the first and second connections.

191. A connection controller according to claim 190, wherein the first and second destination addresses and the first and second destination nodes are the same.

192. A connection controller according to claim 190, wherein the first and second identifiers are the same.

193. A connection controller according to claim 189, wherein the network is an Ethernet network and the transport node is an Ethernet switch.

194. A connection controller according to claim 193, wherein the identifier is a VLAN tag.

195. A connection controller according to claim 189, wherein the network is at least partially meshed.

196. A connection controller according to claim 189 physically co-located with the transport node.

197. A frame-based network comprising the connection controller of claim 189.

198. A method of establishing a connection in a frame-based network, the method comprising the steps of:

configuring forwarding information in a plurality of nodes of the network the forwarding information enabling the nodes to forward data frames in

dependence on a combination of a destination address and an identifier of the data frames.

199. A method of data traffic engineering in a frame-based network, the method comprising the following steps:

establishing a first and second connections in the network passing through a common switching node of the network,

configuring the switching node to forward data frames differently in dependence on differences in either a destination address or an identifier of the data frames, thereby enabling data traffic engineering.

200. A method of establishing connections in a frame-based network, the method comprising the step of:

configuring, in each of a first plurality of nodes of the network, a first forwarding mapping from a first combination of a destination address and an identifier to a selected output port of a respective node of the first plurality of nodes.

201. A method according to claim 200 comprising the further step of:

configuring, in at least one of the first plurality of nodes, a second forwarding mapping from a second combination of a destination address and an identifier to a selected output port of the at least one node,

wherein the first and second mappings at the at least one node respectively map to different output ports of the at least one node.

202. A connection controller for establishing connections in a frame-based network, the connection controller being arranged to configure a first forwarding mapping in a transport node, the first mapping being from a first combination of a destination address and an identifier to a first output port of the transport node.

203. A connection controller according to claim 202, the connection controller being arranged to configure a second forwarding mapping in the transport node, the second mapping being from a second, different combination of a destination address and an identifier to a second, different output port of the transport node, thereby to enable differential forwarding of data frames by the transport node in dependence on a combination of a destination address and an identifier of the data frames.

204. A method of forwarding data frames in a frame-based network, the method comprising the steps of:

establishing a first connection in the network, the first connection being associated with a first combination of a destination address and an identifier, and

forwarding data frames in the network in dependence on a combination of a destination address and an identifier of the data frames.

205. A method according to claim 204, wherein the first connection is routed through a switching node having different first and second output ports connected to other nodes of the network, the method comprising the further steps of:

establishing a second connection in the network through the switching node, the second connection being associated with a second combination of a destination address and an identifier, different to the first combination, and

the switching node forwarding data frames having the first combination of a destination address and an identifier on the first output port and forwarding data frames having the second combination of a destination address and an identifier on the second output port.